



INTERNATIONAL TRUCK AND ENGINE CORPORATION

8391 BEVERLY BOULEVARD, #344, LOS ANGELES, CA 90048

T 323 436 0570

F 323 436 5270

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Alan C. Lloyd, Ph.D.
Chairman
California Air Resources Board
2020 L Street, Room P19
Sacramento, CA 95814

William J. Keese
President
California Energy Commission
1516 Ninth Street, MS-29
Sacramento, CA 95814

James D. Boyd
Commissioner
California Energy Commission
1516 Ninth Street, MS-29
Sacramento, CA 95814

John L. Geesman
Commissioner
California Energy Commission
1516 Ninth Street, MS-29
Sacramento, CA 95814

Re: Draft Staff Report on Reducing California's Petroleum Dependence, Docket No. 01-SRPD-1

Gentlemen:

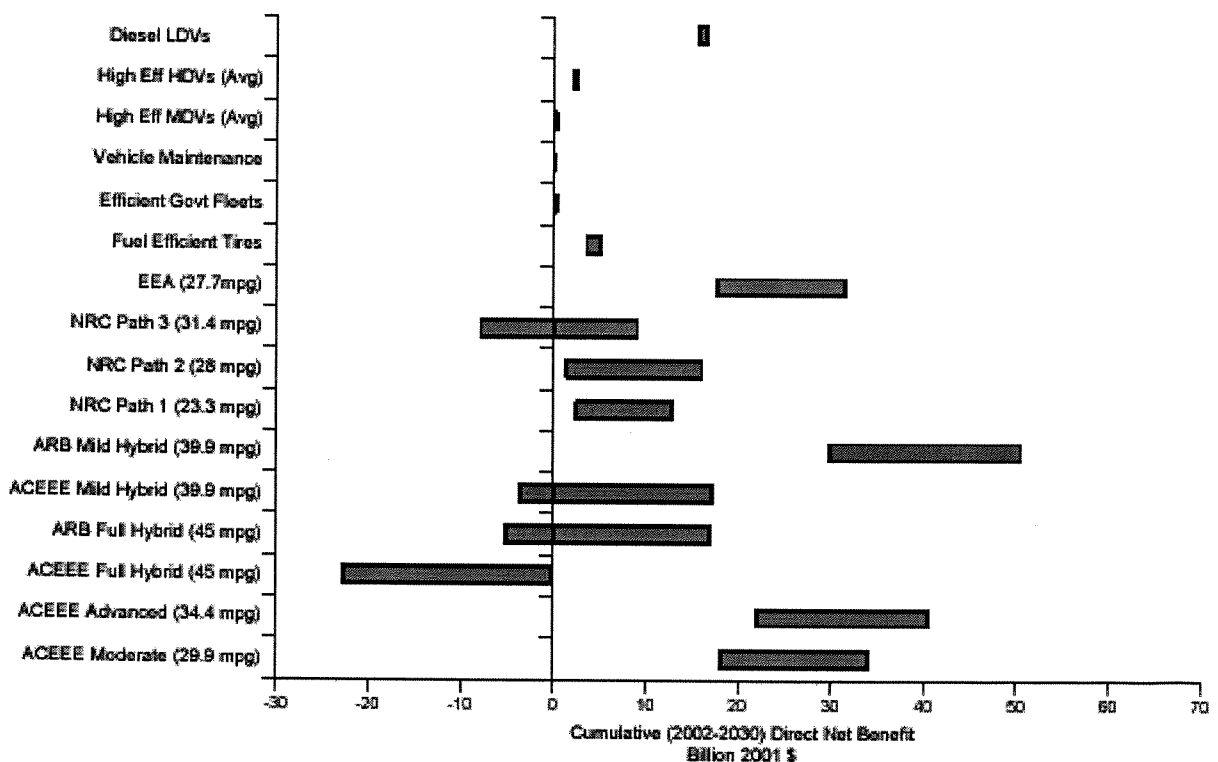
International Truck & Engine Corporation ("International") appreciates this opportunity to comment on the Draft Staff Report on Reducing California's Petroleum Dependence ("Draft Staff Report") prepared by the California Energy Commission ("CEC") and California Air Resources Board ("ARB"). International is a leading North American manufacturer of trucks and school buses. We are also the world's largest manufacturer of mid-range (160-300 hp) diesel engines. Our engines are supplied both to International's Truck Division and to manufacturers of heavy-duty pickups, SUVs and vans. International has also developed a V-6 diesel engine for lighter-duty (under 8500 lbs. GVWR) pickups and SUVs. Our company prides itself on its long history as an industry leader in diesel technology and emissions performance.

International supports the efforts of CEC and ARB to develop strategies to reduce California's dependence on petroleum consumption, and appreciates the willingness of ARB and CEC staff to meet with us on numerous occasions to discuss issues associated with their analysis. We are pleased that the Draft Staff Report recommends light-duty diesel vehicles as one promising technology to increase fuel efficiency and reduce petroleum consumption. Modern diesels have proven fuel-saving benefits when compared to gasoline vehicles, achieve substantial reductions in greenhouse gas emissions, and are on track to meet stringent new emission standards for conventional pollutants. We are also pleased that the Draft Staff Report recognizes the benefits of Fischer-Tropsch diesel fuel.

International nonetheless remains concerned that the direct net benefits calculated for light-duty diesel vehicles and reported in Figure 3 of the Executive Summary dramatically understate the actual benefits of this option and imply that other technologies, such as hybrid

electric drive vehicles, will yield significantly higher benefits. There are three core reasons for this understatement: (1) the Draft Staff Report assumes only 10% market penetration for diesel light-duty vehicles, but 100% market penetration for all other fuel efficiency options; (2) the Draft Staff Report significantly overstates diesel particulate matter (“PM”) emissions as compared to gasoline PM emissions, and simultaneously overstates the monetary health impacts of PM; and (3) the Draft Staff Report includes an error in the conversion of diesel fuel into gasoline fuel equivalents, thereby discounting the actual fuel efficiency gains from diesel (which provide both a monetary benefit and a reduction in greenhouse gas emissions). If these errors are corrected, diesel will be shown to have \$14.5 billion in direct net benefits, as illustrated below.

Revised Figure 3
Direct Net Benefits of Fuel Efficiency Options (With Light-Duty Diesel Assumptions Corrected)



We are also concerned that the Draft Staff Report understates the environmental costs of greater reliance on compressed natural gas (“CNG”) vehicles because it does not take into account recent ARB studies documenting CNG emissions of both toxic pollutants and PM.

Market Penetration Assumptions. Figure 3 of the Executive Summary provides the direct net benefits of various fuel efficiency options. Significantly, *every option in Figure 3 except diesel is assumed to have a 100% market penetration – while diesel is assumed to have only a 10% market penetration.* In other words, for purposes of assessing direct net benefits, the Draft Staff Report assumes that any technology under consideration other than diesel, including

various types of hybrid vehicles, will have achieved 100% market penetration by 2012 – but diesel will have achieved no more than 10% market penetration by the same date.

Assuming a 100% market penetration rate for hybrids artificially inflates their potential petroleum reduction benefits, while assuming only a 10% market penetration for diesel artificially understates its petroleum reduction benefits. Light-duty diesel is a proven, existing petroleum reduction technology that provides consumers with the performance and durability they desire. To assume that light-duty diesels will have *one-tenth* the market penetration of hybrids is to discount these significant benefits while overlooking the limitations of hybrid technology in meeting consumer needs. Indeed, in Europe, overall dieselization of the light-duty market has reached well over 50 percent in some countries, while hybrids are subsidized in the U.S. and as yet have not achieved measurable market share. It is hard to see how hybrids will achieve greater market penetration than light-duty diesel – let alone 100% market share – in the absence of a government mandate requiring a complete conversion to hybrid technologies.¹

The differential market penetration assumptions in Figure 3 result in an “apples to oranges” comparison, which will be misleading to policymakers and is technically inaccurate. If equivalent market penetration rates were assumed, the benefits of all options other than diesel would be *one-tenth* of what they appear to be in Figure 3. Alternatively, the benefits of the diesel option would be ten-fold greater than what appears on Figure 3. This adjustment would more fairly reflect the relative net benefits of light-duty diesel as compared to other options and foster more balanced judgments about the most appropriate petroleum reduction policies to pursue.²

To allow for a reasoned comparison among the different petroleum reduction options, International strongly urges that Figure 3 of the Draft Staff Report be revised to assume the same market penetration rates for all technologies under consideration. At a bare minimum, if the Draft Staff Report is not revised in this manner, the header for Figure 3 should prominently and clearly highlight that ARB and CEC have assumed a 10% market penetration for diesel, but a 100% market penetration for all other options, as follows:

Figure 3
Direct Net Benefits of Fuel Efficiency Options (Assumes 10% Market Penetration for Light-Duty Diesel and 100% Market Penetration for All Other Options)*

***These market penetration assumptions result from the different methodologies that were used to evaluate different fuel economy options and do not reflect any determination about the relative market penetration rates that light-duty diesel and other fuel economy options are expected to achieve in practice.**

¹ Such a government mandate, of course, is highly unlikely given the American cultural norm that the government should not dictate customer choice.

² The fact that the diesel option includes “10%” in parentheses does nothing to elucidate this issue; unless the policymakers read the entire 900 pages of appendices, there is no way that they will understand that the Draft Staff Report assumes a different market penetration rate for diesel than it assumes for all other options.

Assumptions About Particulate Matter Emissions And Monetary Health

Impacts. The overall net benefits of diesel are significantly influenced by two assumptions made about PM emissions: (1) light-duty diesel vehicles will emit significantly more particulate matter than light-duty gasoline vehicles; and (2) the net monetary benefit of reducing one ton of PM is \$352,000 (or, conversely, the public health cost of one ton of PM is \$352,000). Both assumptions are questionable, and both dramatically reduce the total net benefits of the light-duty diesel option in the Draft Staff Report.

ARB has assumed in the Task 1 report that light-duty gasoline vehicles will emit PM at levels of 0.002 g/mi, but that light-duty diesel vehicles will emit PM at 0.010 g/mi. ARB is correct in assuming that light-duty diesel vehicles will meet or exceed a 0.010 g/mi PM standard; International is confident that our engines will be able to do so.

However, we question the conclusion that gasoline vehicles will emit less PM than diesel vehicles. As International has explained in prior letters, since the PM emission standards will be the same for diesel and gasoline vehicles starting in 2007, ARB's approach requires convincing empirical data that gasoline vehicles will consistently perform well below the standard whereas diesel vehicles will not. Yet ARB has relied on only portions of the data from a single 1998 study for its conclusions about gasoline emissions, while refusing to consider the results of multiple recent studies about PM emissions from trap-equipped light-duty diesel vehicles, as compared to gasoline vehicles.³ Given the significant distortion in the benefits analysis that results from ARB's assumption and the limited data on which it is based, International strongly believes that the analysis should be revised to assume that all fossil fuel-fired light duty vehicles (whether gasoline, diesel, or CNG) emit 0.010 g/mi PM.

This issue attains heightened importance because ARB's assumptions about the monetary benefit of reducing a ton of PM vastly exceeds the monetary value of reducing any other pollutants. Thus, a technology that is assumed to emit more PM – as compared to any other pollutants – will thereby appear to have significantly lower net environmental benefits (which translates into lower net benefits). As International has demonstrated in prior comments, including a detailed critique presented by International's contractor, Gradient Corporation, ARB has vastly overstated the potential health benefits associated with reducing a ton of PM. Indeed, International has provided ARB with data from U.S. EPA demonstrating that EPA's valuation of reducing a ton of PM from motor vehicles is in the range of \$25,000 – *fourteen times lower than the number in the Task 1 Report.*⁴ By simultaneously overstating light-duty diesel's PM

³ International has provided ARB with the results of multiple studies showing *both* that a light-duty diesel vehicle equipped with a particulate trap can attain the emissions performance required under the LEV II standards by a sizable margin *and* that PM emissions from trap-equipped light-duty diesel vehicles will be *as low or even lower than* PM levels emitted by light-duty gasoline vehicles.

⁴ Tables II.B-19 through II.B-22 in Chapter II (pages II-138 to II-139) of EPA's "Regulatory Impact Analysis: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements" (EPA 420-R-00-026, December 2000) show that total vehicle emissions reductions resulting from the HD Engine/Diesel Fuel regulation achieved by the year 2030 are expected to be 2.8 million tons per year (mostly NOx reductions; vehicle primary PM emissions are projected to go down by 0.11 million tons per year). The total monetized benefits of the HD

emissions as compared to light-duty gasoline and overstating the monetary benefits associated with reducing a ton of PM, ARB has incorrectly concluded that the light-duty diesel petroleum reduction option will result in a net environmental cost, rather than a net environmental benefit.

International urges that these assumptions be corrected, and that both the Task 1 Report and Figure 3 of the Draft Staff Report be revised to include re-calculated direct environmental net benefits based on: (1) gasoline and diesel achieving the same PM emission level; and (2) the monetary health benefit of a ton of PM being approximately \$25,000 per ton.

Gasoline Equivalent Conversion Factor. The Draft Staff Report includes a critical conceptual error related to the evaluation of the relative fuel efficiencies of diesel and gasoline. Specifically, the Report adjusts the diesel and gasoline fuel efficiencies to be equivalent on a BTU per gallon basis, when in fact diesel has a higher energy content than gasoline and, as a result, *less* volume of petroleum fuel is required for a diesel engine to travel any given distance.

Using the ARB/CEC assumptions of 21.2 mpg for gasoline and 30.7 mpg for light-duty diesel, other commenters have calculated that this incorrect conversion results in the Draft Staff Report undercounting the petroleum reduction potential of light-duty diesel by 10%. International urges that the Task 3 and Task 4 Reports, and Figure 3 of the Draft Staff Report, be corrected to reflect light-duty diesel's actual petroleum reduction potential.

This error also results in the understating of greenhouse gas reduction benefits of the light-duty diesel option. Assuming a direct correlation between reduction in petroleum and reduction in greenhouse gas emissions, the greenhouse gas benefit of the light-duty diesel option similarly should increase by 10%. Finally, a 10% reduction in petroleum usage should also result in a 10% reduction in the external cost of petroleum dependency (*i.e.*, a 10% increase in the cumulative benefit of the light-duty diesel option with respect to costs of petroleum dependency), as calculated in the Draft Staff Report. We urge ARB and CEC to correct the Task 1 Report and Figure 3 of the Draft Staff Report to include these additional benefits as well.

Implications for Direct Net Benefits of Diesel. International has done a rough re-calculation of the direct net benefit of light-duty diesel, once the above three issues are corrected. The calculations are provided in an Attachment to these comments. In brief, after correcting for the above errors, the direct net benefits of diesel increase from \$0.81 billion to \$14.5 billion. Figure 3 of the Draft Staff Report should include this revised direct net benefit number.

Emissions Profile of CNG. In addition to the issues identified above, the Task 1 Report significantly understates CNG's emissions of both toxics and PM. Specifically, Table 2-

Gasoline Engine/Diesel Engine Fuel regulation achieved in the year 2030 are expected to be \$70.4 billion annually (p. xv). Hence, the dollar benefit per ton of vehicle emissions reduced (in the year 2030), from this USEPA document is: \$70.4 billion (annually) / 2.8 million tons (annually) = \$25,143 per ton. (EPA does not calculate separate environmental benefits for direct versus indirect PM emissions.) The Task 1 Report nonetheless claims that EPA's MY 2007 rulemaking included health benefits of \$313,765 for direct PM emissions, but provides no rationale for how it arrived at this estimate.

11 of the Task 1 Report (p. 2-16) concludes that the CNG option will result in a reduction of 49 tons of air toxics, whereas the light-duty diesel option will increase air toxics emissions by 1,177 tons. Similarly, the Task 1 Report concludes that the CNG option will increase PM emissions by 249 tons, but the diesel option will increase PM emissions by 4,416 tons. These estimates are inconsistent with ARB's own data on the relative emissions profiles of CNG and diesel.

As we have discussed in prior comments, data generated in a study by ARB demonstrate that natural gas exhaust contains much higher levels of the constituents considered toxic by ARB than diesel exhaust.⁵ This ARB study demonstrated that new diesel technology has lower emissions than natural gas in 8 of 11 emission categories, including lower total particulate mass, ultrafine particle numbers, aldehydes, mutagenicity, polycyclic aromatic hydrocarbon ("PAH") species, total hydrocarbons, other total volatile organic compounds ("VOCs") and carbon monoxide.⁶

The ARB study also showed that natural gas was 7 to 8 times more mutagenic than low emitting diesel, and that natural gas emits significantly more toxic gases, such as 1,3-butadiene, toluene, xylenes, styrene, benzene and ethyl-benzene, as well as formaldehyde, acetaldehyde and PAHs. Moreover, natural gas exhaust contains PM emissions that are finer than those in low-emitting diesel, and unlike diesel, which can use CDPFs to remove PM from exhaust, there are currently no particulate traps available for use on natural gas vehicles. The study also demonstrates that total hydrocarbon emissions from natural gas vehicles were substantially higher than from low-emitting diesel, and that those higher emissions were primarily the result of high emissions of methane, a potent greenhouse gas. These results have been corroborated by a host of other studies.⁷

In light of these data, it is not reasonable to assume that light-duty diesel will emit *more* toxics and PM than will CNG. In fact, the available data show just the opposite. If this error in the Task 1 Report is corrected, the benefits of CNG will be significantly lower than what is currently projected.⁸ In addition to the higher costs of natural gas vehicles, this consideration

⁵ See Ayala, "Comparative Study of Diesel and Heavy-Duty Transit Bus Emissions," (Paper presented at Coordinating Research Council On-Road Vehicle Emissions Workshop, April 16, 2002).

⁶ While the ARB study demonstrated that natural gas has lower NOx, NO2/NOx and CO2 emissions than low-emitting diesel, NOx emissions will be significantly reduced in diesels with the addition of the NOx adsorbers required to meet EPA's new emission standards. Because of their greater fuel efficiency, diesel vehicles also emit less total greenhouse gases than CNG vehicles.

⁷ See, e.g., Miriam Lev-On, et al. "Chemical Speciation of Exhaust Emissions from Trucks and Buses Fueled on Ultra-Low Sulfur Diesel and CNG," SAE 2002-01-0432 (March, 2002); Peter Ahlvik and Ake Brandberg, "Relative Impact on Environmental and Health from the Introduction of Low Emission City Buses in Sweden" (2000); Matthew Newkirk and Edward A. Bass, "Reactivity Comparison of Exhaust Emissions from Heavy-Duty Engines Operating on Gasoline, Diesel and Alternative Fuels," (Southwest Research Institute, 1995).

⁸ Currently, the Task 1 Report does not quantify the monetary value of reducing air toxics. Moreover, International has recommended above that ARB assume that all fossil fuel-fired light-duty vehicles be assumed to emit at the LEV-II standard. If ARB makes this correction, then the

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further calls into question the soundness of the Draft Staff Report recommendation for significantly increased use of alternative fuels by 2020.

* * *

In conclusion, International appreciates this opportunity to comment on the Draft Staff Report, and is encouraged that the Report includes light-duty diesel engines and Fischer-Tropsch diesel as recommended options to reduce petroleum dependence. We also appreciate the willingness of ARB and CEC staff to meet with us. We continue to be concerned, however, that the underlying analysis contains some significant errors that result in dramatically understating the actual direct net benefits for diesel engines. If these errors are corrected, International believes that light-duty diesel will have significantly greater net benefits than are currently reported in Figure 3 of the Executive Summary.

Sincerely,

Gretchen A. Knudsen
Gretchen A. Knudsen

Manager, California Public Policy Program
International Truck and Engine Corporation

monetary benefit of the CNG option would not change significantly. However, if ARB retains its current assumption of differential PM emissions from gasoline, CNG and diesel, then the benefits of the CNG option would decrease significantly if the emissions profile of CNG is corrected.

ATTACHMENT

Calculation of Direct Net Benefits of Diesel

International has done a rough re-calculation of the direct net benefit of light-duty diesel, once the above three issues are corrected. Page 4-14 of the Task 4 Report provides the following formula for calculating direct net benefits:

$$\text{Direct Net Benefits} = \text{DENB} + \text{ECPD} + \text{DNNB}$$

where:

DENB is direct environmental net benefits

ECPD is external cost of petroleum dependency; and

DNNB is direct non-environmental net benefits

The Task 4 Report further specifies that for light-duty diesel, DENB is -\$0.07 billion, ECPD is +\$0.18 billion and DNNB is +\$0.7 billion, for a total direct net benefit of +\$0.81 billion (\$810 million).

First, the erroneous PM assumptions going into the DENB need to be corrected. Table 4-4 of the Task 4 Report shows that the DENB for diesel is comprised of three components: (1) air quality at -\$0.42 billion; (2) greenhouse gases at +\$0.33 billion; and (3) water pollution at +\$0.02 billion. If we make the correct assumption that PM emissions are equal for diesel and gasoline vehicles (*i.e.*, zero monetary benefit resulting from PM emissions), and use ARB's assumptions and calculations with respect to the other pollutants, the light-duty diesel option results in a net air quality benefit of +\$0.12 billion.⁹ Accordingly, the DENB for the light-duty diesel option changes to +\$0.47 billion.¹⁰

Second, the conversion of diesel into gasoline equivalents understated the actual petroleum reduction resulting from the light-duty diesel option by 10%. Accordingly, the DNNB – current valued at +\$0.68 billion – should be increased by 10% to +\$0.75 billion.

Third, assuming a direct correlation between reduction in petroleum and reduction in greenhouse gas emissions, the greenhouse gas benefit of the light-duty diesel option similarly should be increased from +\$0.33 billion to +\$0.36 billion, thereby increasing the total DENB of the light-duty diesel option to +\$0.50 billion.

Fourth, a 10% reduction in petroleum usage should also result in a 10% reduction in the external cost of petroleum dependency (*i.e.*, a 10% increase in the cumulative benefit of the light-duty diesel option with respect to costs of petroleum dependency). Table S-1 of the Task 4 Report currently values the light-duty diesel benefit with respect to external costs of

⁹ Table 2-11 of the Task 1 Report shows that the light-duty diesel option will reduce NOx by 291 tons, CO by 192 tons and NMOG by 19,145 tons. Using ARB's valuation of these pollutants (\$220 for a ton of CO, \$88,000 for a ton of NOx, and \$5,000 for a ton of VOCs) results in a net air quality benefit of +\$0.12 billion.

¹⁰ +\$0.12 billion + \$0.33 billion + \$0.02 billion = +\$0.47 billion.

petroleum dependency at +\$0.18 billion. Increasing this benefit by 10% results in a revised ECPD of +\$0.20 billion.

Summing these components results in a Direct Net Benefit of +\$1.45 billion (\$0.75 billion DNNB + \$0.5 billion DENB + \$0.20 billion ECPD = \$1.45 billion).

Finally, making the correct comparison with *all* options under consideration having the same market penetration requires that the direct net benefit for diesel be multiplied by 10 (10% x 10 = 100%, the market penetration assumed for all other options).¹¹ The corrected 10% market penetration value for diesel is +\$1.45 billion. Correcting for market penetration increases the light-duty diesel direct net benefits to +\$14.5 billion. Figure 3 of the Draft Staff Report should include this revised direct net benefit number.

¹¹ It would be equally valid to divide the direct net benefits of all other options by 10, but correcting only the light-duty diesel option is simpler to accomplish.